

CLAIMS

1. A method for inspecting a component mounting accuracy in component mounting operation for mounting a component (1) held by a component holding member (22) on a board (3), comprising:

with use of an inspection-use component (5) having an almost rectangular parallelepiped shape and having an irreflexive surface (5a) as one surface and a reflecting surface (5b) as a surface opposed to the one surface, while applying light (W1) to the reflecting surface of the inspection-use component in a state that the irreflexive surface is held by the component holding member, picking up a real image of the inspection-use component formed by reflected light (W2) created by the applied light;

recognizing a posture of the inspection-use component held by the component holding member through recognizing image data of the picked up real image;

mounting the inspection-use component by the component holding member in such a way that the reflecting surface of the inspection-use component is disposed in a component mounting position on a component mounting side-surface (7a, 10a) of an inspection-use board (7, 10) which is formed from a light transmitting material and which has a reflecting surface (8a, 9) disposed on a surface opposed

to the component mounting side-surface in a state of facing the component mounting side-surface, while correcting posture-displacement between the recognized holding posture and a reference holding posture;

5 while applying light (W11, W21) to the component mounting-side surface of the inspection-use board so as to transmit the applied light through the component mounting-side surface and reflect the applied light on the reflecting surface, picking up an image of an outline of
10 the inspection-use component formed by reflected light (W12, W22) coming from around the inspection-use component through the component mounting-side surface; and

15 calculating an actual mounting position of the inspection-use component by recognizing image data of the picked up outline, and then obtaining component mounting accuracy by calculating a difference between the actual mounting position and the preset component mounting position.

20 2. The method for inspecting the component mounting accuracy as defined in Claim 1, wherein the light transmitting material is a glass material.

25 3. The method for inspecting the component mounting accuracy as defined in Claim 1, wherein the reflecting

surface of the inspection-use board is a specular reflecting surface (9) for specular reflection of the applied light, and

the inspection-use board has a diffusion layer
5 (10c) disposed in between the component mounting-side surface and the specular reflecting surface, for diffusing the specular-reflected light.

4. The method for inspecting the component mounting accuracy as defined in Claim 1, wherein the reflecting surface of the inspection-use board is a diffuse reflecting surface (8a) for reflecting the applied light with diffusing.

15 5. The method for inspecting the component mounting accuracy as defined in Claim 4, wherein the diffuse reflecting surface is formed by applying a diffuse reflection sheet (8) onto an opposite surface of the inspection-use board.

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6. A method for inspecting a component mounting accuracy in component mounting operation for mounting a component (1) held by a component holding member (22) on a board (3), comprising:

25 mounting the component by the component holding

member in a component mounting position on a component mounting side-surface (7a, 10a) of an inspection-use board (7, 10), which is formed from a light transmitting material and which has a reflecting surface (8a, 9) disposed on a
5 surface opposed to the component mounting side-surface in a state of facing the component mounting side-surface;

while applying light (W11, W21) to the component mounting-side surface of the inspection-use board so as to transmit the applied light through the component mounting-
10 side surface and reflect the applied light on the reflecting surface, picking up an image of an outline of the component formed by reflected light (W12, W22) coming from around the component through the component mounting-side surface; and

15 calculating an actual mounting position of the component by recognizing image data of the outline acquired by the image pickup operation, and then obtaining component mounting accuracy by calculating a difference between the actual mounting position and the preset component mounting
20 position.

7. An apparatus for inspecting a component mounting accuracy in a component mounting apparatus (101) for mounting a component (1) held by a component holding member
25 (22) on a board (3), comprising:

an inspection-use board (7, 10) which is held by
the component mounting apparatus in place of the board and
formed from a light transmitting material, and which has a
reflecting surface (8a, 9) disposed on a surface opposed to
5 its component mounting-side surface (7a, 10a) in a state of
facing the component mounting-side surface;

an inspection-use component (5) which is fed to
the component mounting apparatus in place of the component
and forms an almost rectangular parallelepiped shape having
10 an irreflexive surface (5a) as one surface and a reflecting
surface (5b) as a surface opposed to the one surface, and
which is held by the component holding member with its held
surface as the irreflexive surface and is mounted on the
inspection-use board in such a way that the reflecting
15 surface faces the component mounting-side surface of the
inspection-use board;

a component image pickup device (24) for applying
light (W1) to the reflecting surface of the inspection-use
component in a state that the irreflexive surface is held
20 by the component holding member and picking up an image of
the inspection-use component formed by reflected light (W2)
created by the applied light;

a board image pickup device (25) for applying
light (W11, W21) to a component mounting-side surface of
25 the inspection-use board with the inspection-use component

mounted in a component mounting position so as to transmit the applied light through the component mounting-side surface and reflect the light on the reflecting surface, and picking up an image of an outline of the inspection-use component formed by reflected light (W12, W22) coming from around the inspection-use component through the component mounting-side surface;

a holding posture recognition section (63) for recognizing a posture of the inspection-use component held by the component holding member through recognizing image data of a real image of the inspection-use component in a state of being held, so as to correct posture-displacement between the recognized holding posture and a reference holding posture;

a mounting position recognition section (64) for recognizing an actual mounting position of the inspection-use component through recognizing image data of the outline of the inspection-use component in a state of being mounted; and

a mounting accuracy operation section (73) for obtaining the component mounting accuracy through calculating a difference between the actual mounting position recognized by the mounting position recognition section and the preset mounting position of the inspection-use component.

8. The apparatus for inspecting the component mounting accuracy as defined in Claim 7, wherein the light transmitting material is a glass material.

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9. The apparatus for inspecting the component mounting accuracy as defined in Claim 7 or 8, wherein the reflecting surface of the inspection-use board is a specular reflecting surface (9) for specular reflection of
10 the applied light, and

the inspection-use board has a diffusion layer (10c) for diffusing the specular-reflected light.

10. The apparatus for inspecting the component mounting accuracy as defined in Claim 7 or 8, wherein the reflecting surface of the inspection-use board is a diffuse reflecting surface (8a) for reflecting the applied light with diffusing.

20 11. An apparatus for inspecting a component mounting accuracy in a component mounting apparatus (101) for mounting a component (1) held by a component holding member (22) on a board (3), comprising:
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an inspection-use board (7, 10) which is held by

the component mounting apparatus in place of the board and

formed from a light transmitting material, and which has a reflecting surface (8a, 9) disposed on a surface opposed to its component mounting-side surface (7a, 10a) in a state of facing the component mounting-side surface;

5 a board image pickup device (25) for applying light (w11, W21) to a component mounting-side surface of the inspection-use board with the inspection-use component mounted in a component mounting position so as to transmit the applied light through the component mounting-side 10 surface and reflect the light on the reflecting surface, and picking up an image of an outline of the inspection-use component formed by reflected light (W12, W22) coming from around the component through the component mounting-side surface;

15 a mounting position recognition section (64) for recognizing an actual mounting position of the component through recognizing image data of the outline of the component in a state of being mounted; and

20 a mounting accuracy operation section (73) for obtaining the component mounting accuracy through calculating a difference between the actual mounting position recognized by the mounting position recognition section and the preset mounting position of the component.